A Botulism Outbreak: Utilizing PHIN End to End

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Presentation Goals/Outline

- Use a botulism outbreak example to show:
  - *Workflow/notification process* of an urgently reportable disease
    - (from LIMS to LRN to IDR to HAN)
  - Related *data flow* (PHIN END-END VISION)
    - from ER doc all the way through to CDC and back from CDC lab to local PH lab, staff, and ER
  - Current *data workflow in "real world"*
  - *Ideal system workflow*
  - Potential *points of failure*

Scenario

- Food service truck leaves Denver carrying tomato paste contam. w/ Botulinim toxin
- Heads north on I-25 then west on I-80
- Deliveries made in: Cheyenne, Laramie, Rawlins, Rock Springs & Green River to restaurants serving over 2,000 patrons.

Scenario: Botulinim toxin symptoms

- Cowgirl Jill is feeling downright bad in the saddle, thinking: "I really didn't drink that much last night".
- Her signs & symptoms:
  - double or blurred vision
  - difficulty swallowing
  - nausea
  - slurred speech
  - vomiting
  - muscle weakness
  - GI distress

= Symptoms of muscle paralysis caused by bacterial toxin. If untreated, may progress to:

- paralysis of the arms, legs, trunk, respiratory muscles

Scenario, cont.

- Day 1: Her symptoms are recognized as suspect bot at the Cheyenne ER.
  - Consultation w CDC re. pt. management
  - Bot antitoxin is immed. requested by ER to state
  - Appropriate lab samples are collected
- Day 1: Within hours additional patients presenting such symptoms surface in ER rooms in Cheyenne, Laramie, Rawlins, Rock Springs & Green River
- Day 2: Multiple patients present over the border in Colorado
- Day 3: Media finds out.

The Facts: a Bot case means *fast action*

- A botulism case is always a PH emergency
  - Window for antitoxin
  - Risk of sequelae or death if untreated
  - Cat. A list, CDC
- Incubation 18-36 hrs after eating contaminated food; but can range 6 hrs-10 days
  - Incub. variable can = new but related cases over TIME
  - Non-communicable
  - Attributed to toxins A,B,E,F and unspecified
- About 110 bot cases US/yr; 25% are foodborne

Different types of bot. = different notification trees

- There is infant bot., wound bot. and GI bot
  - All = emergencies but 1st two endemic and are indiv cases
  - GI bot has potentialyl for large scale outbreaks but not uncommon
  - Are more health/clinical than PH emergencies

- For all bot outbreaks:
  - rule out poss BT via lab & case data
    - Suspect BT path (chain of custody, FBI etc)

- For GI bot: Foodborne OB path. **Key data to move thru system**

  - **Datapoint #1:** From CDC lab: toxin type from mouse inoc.
  - Datapoint #2: Matching toxin type to suspect food
  - **Datapoint #3:** Geog. location of patient

The Facts: a Bot case means *fast action*

- 2 cases of anything = an outbreak
  - High # cases or mult. geog. areas = suspect BT
  - Mult. cases of foodborne bot = emergency
    - *Get that food off the store or home refrig shelf!*
    - Multiple parallel agencies and actions
      - Involves local PH regardless- PH nurses/Epis etc
      - If a commercial product may involve
        - USDA, FDA
      - If a restaurant/caterer may involve
        - Environmental Health/Restaurant Inspectors

Scenario: Impact of many cases

POTENTIAL IMPACTS:

- 1) Impact on public: panic/civil unrest overall
  - Fear re. not knowing source of contamination
  - Fear of eating out
  - Mistrust of food sources
    - Exactly what terrorists bank on: media picks up news, panic after
    - Think back to Tylenol scares: years to regain market acceptance
- 2) Impact on towns: may be variable
  - Rawlins is a very small community
    - will really set the town and hospital on its ear!
  - Cheyenne & Laramie will be better able to handle situation
    - due to population size/diversity (Warren AFB, Univ. of WY, etc.)
  - Green River & Rock Springs larger than Rawlins,
    - but still a small town attitude of “It won’t happen here”

Workflow: Notification

Suspect bot demands early notification for clinical reasons:

- 1st notification: from ER doc on scene to CDC
  - ER Drs assess situation; determine suspect bot;
    - Order bot antitoxin, gen. is Fed-Ex'd
    - contacts WDOH hotline
- 2nd notification: should be from ER to Local PH
- 3rd notification: should be from
  - **Local PH to state, or**
  - **CDC back down to state**
- 4th notification: from CDC lab to WDOH PHL if lab-confirmed
- 5th notification: WDOH PHL will alert ordering Dr and local PH

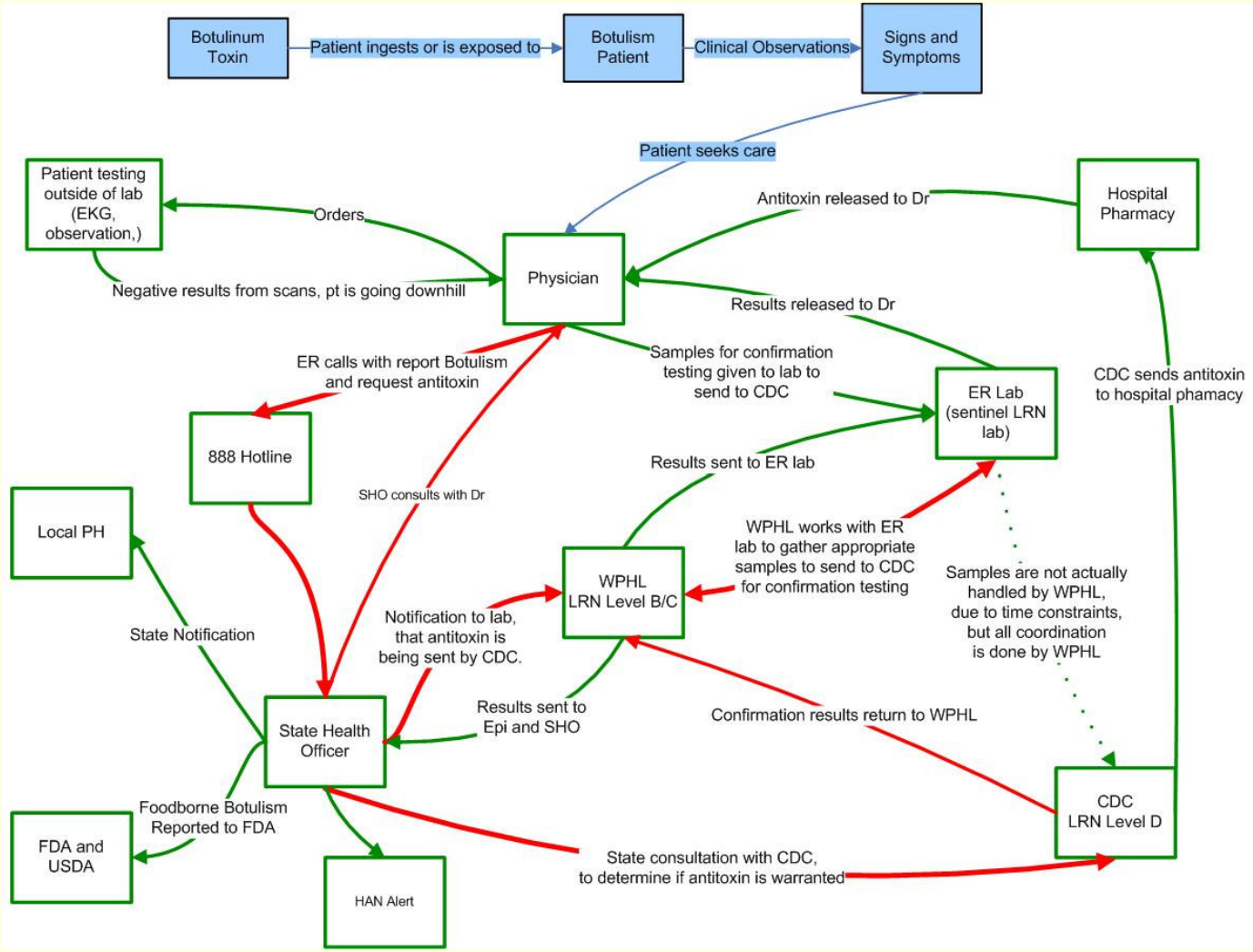
Workflow: Notification

Presently, we are ARTIFICIALLY separating the urgent disease DATA flow from the NOTIFICATION message flow. They CAN be one and the same!

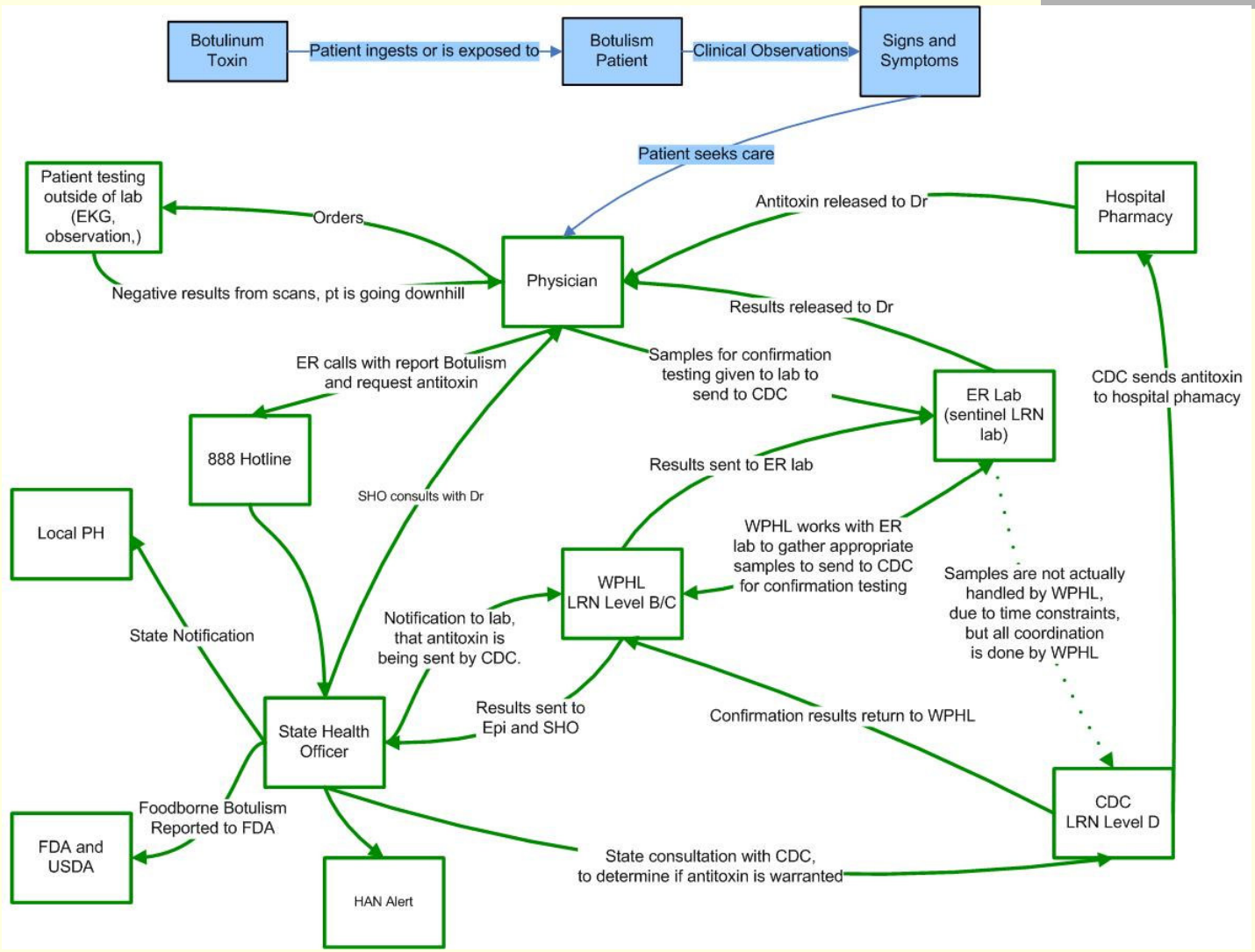
PHIN has given us the vision and platform to do so.

- 1st notification: ER contacts WDOH hotline & CDC to Local PH
  - ***this could be an HL-7 message*** *via hospital system*
- 2nd notification: ER contacts WDOH hotline & CDC to Local PH
  - ***this could be an HL-7 message*** *via the*

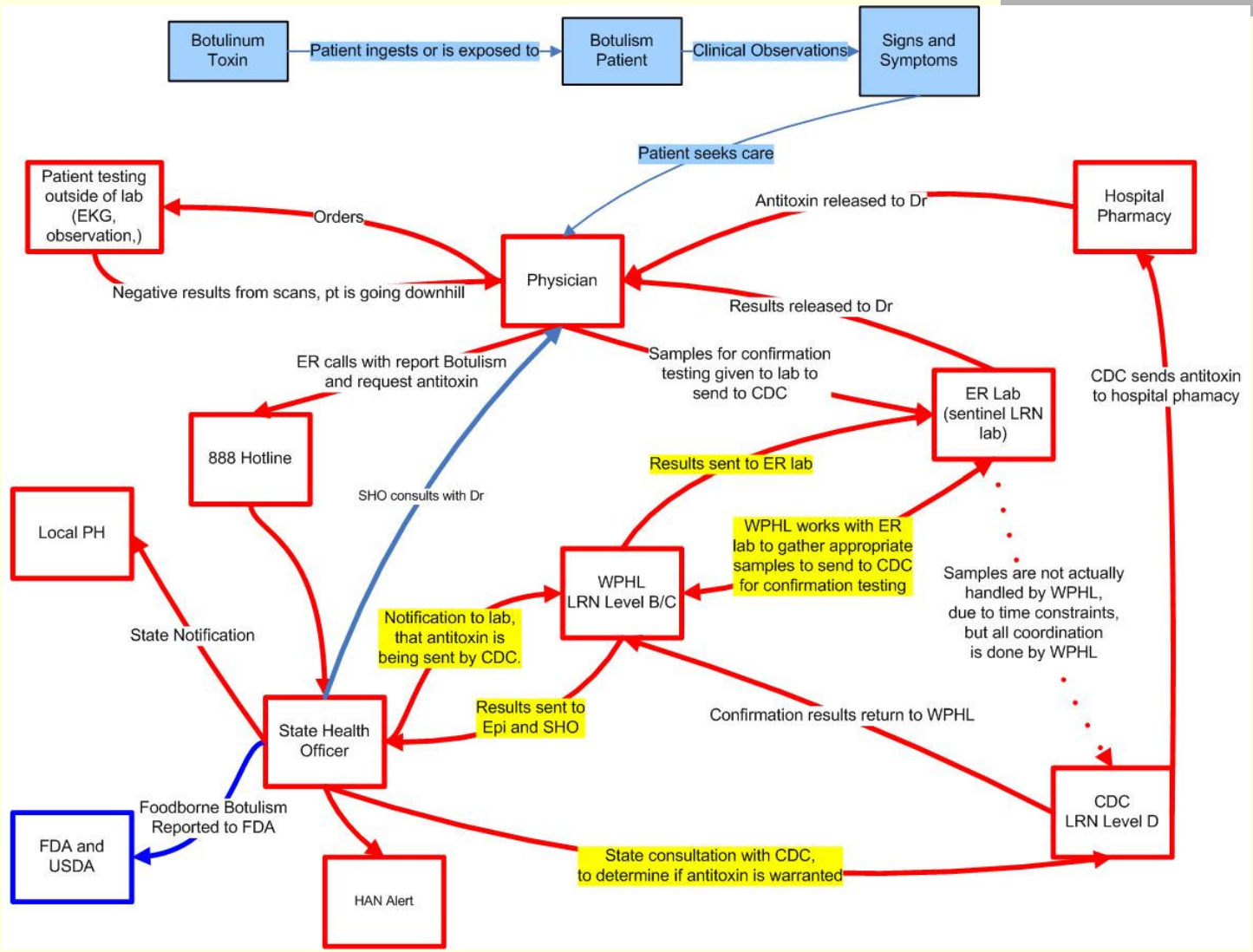
WY Current Communication with possible points of broken communication



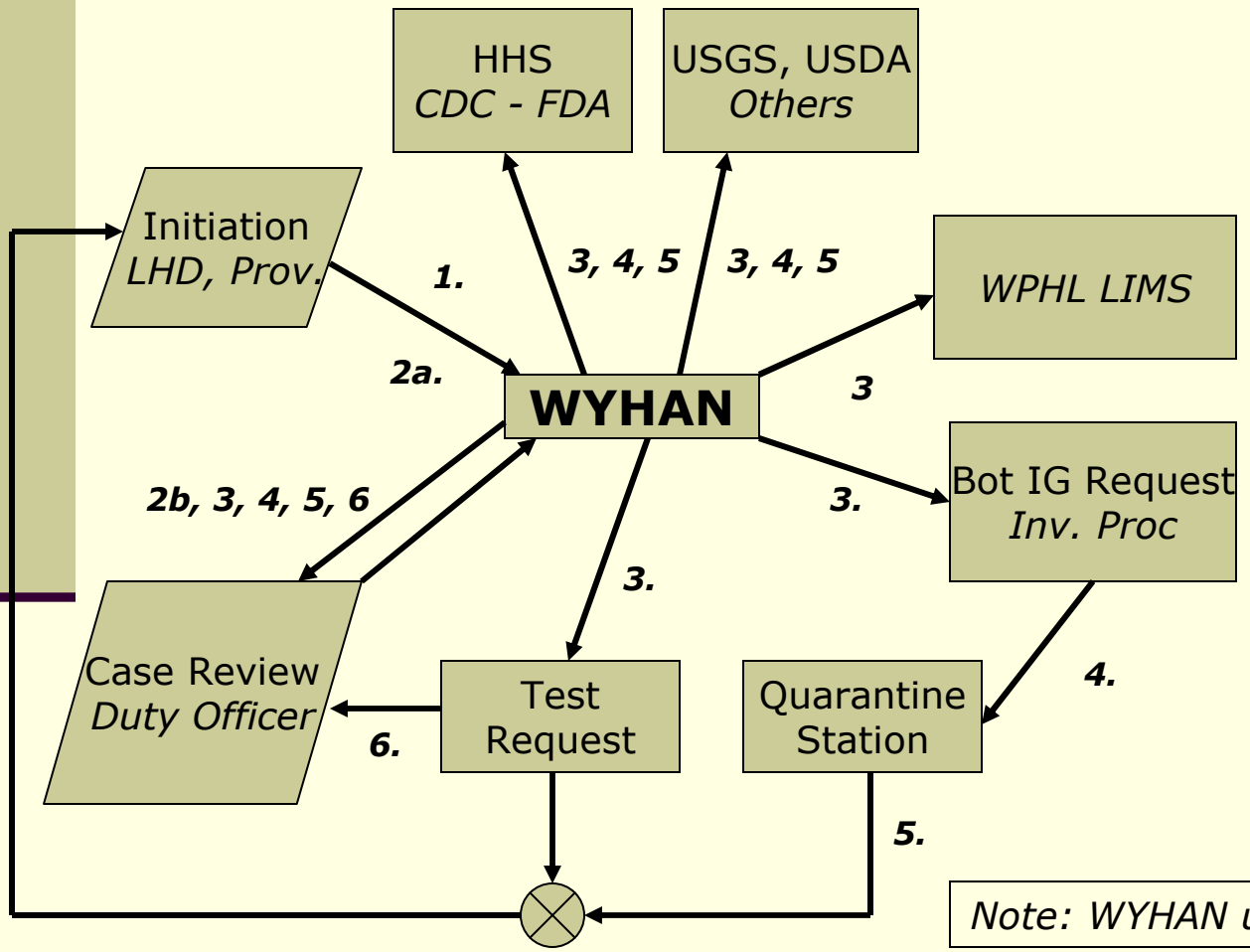
WY Current Communication



Botulism Case DATA flow (Ideal)



Botulism Process Flow



Legend

1. Start of process
2. Botulism CMS uses WYHAN for all subsequent alerts – starts w/DO
3. Once it is a "go" multiple systems are updated via messages – using various mechanisms including XML, HL7, PHINMS
4. Bot IG request goes to Quarantine Station – could initiate SNS process
5. BIG administered
6. At some time later lab results are made available

Note: WYHAN used for all alert/notification

The Facts, Jack: Laboratory Testing

- Routine lab tests not especially helpful w/bot Dx
  - given the nature of the bacteria
- Common tests such as serum chem panels, urinalysis & ECGs can help rule out other diseases
  - but won't ID bot
- Antitoxin must be delivered ASAP
  - given length of time for confirm. testing, antitoxin usually administered prior

- Only currently acceptable confirmatory testing is:
  - mouse toxicity & neutralization bioassay

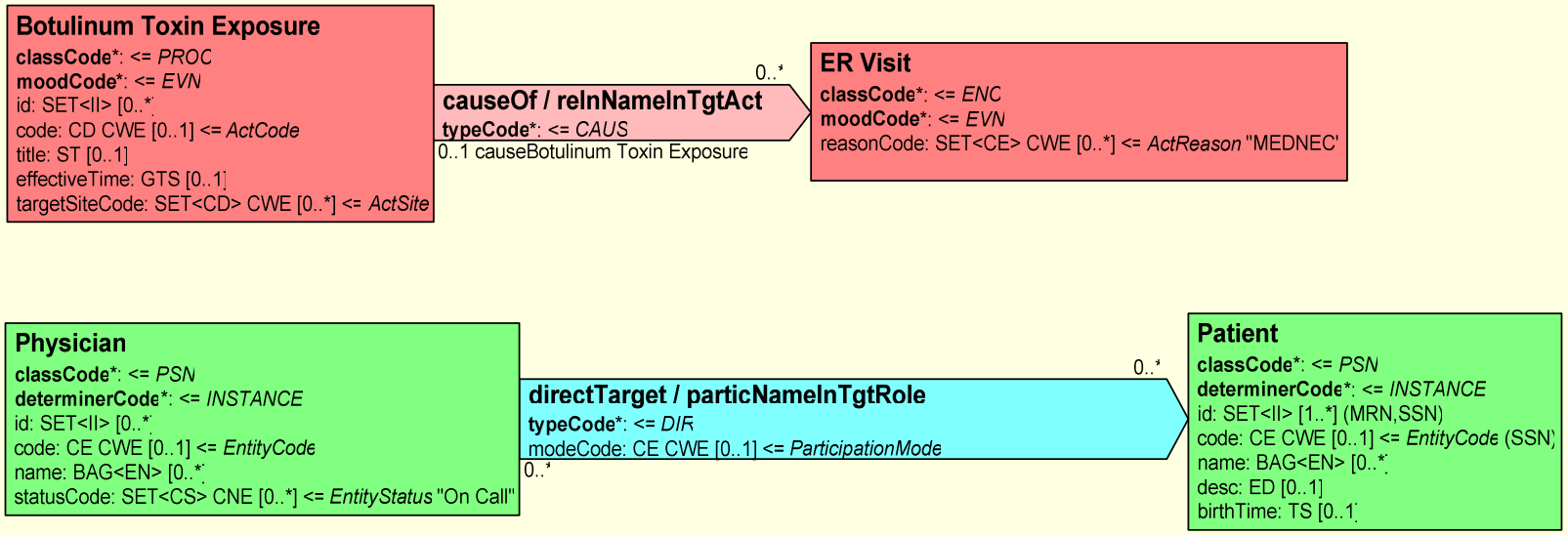
Ideal Automated LRN Workflow Steps

1. LRN starts at the ER lab when samples have been collected
2. WPHL = liaison between ER lab and CDC
3. **SO from that moment LRN has been successfully achieved!**
4. ER lab = sentinel lab where everything starts with sample collection
5. Since WPHL does not do actual bot testing, the samples are raised to next level of LRN,
    1. officially LRN is still working because WPHL = liaison to highest level of LRN – the CDC lab.
6. Samples = sent overnight to CDC for immediate testing
7. Once testing is complete at CDC, results are sent to WPHL
    1. regardless of who initiates testing
    2. if Drs forget/dismiss WDOH hotline and send samples on their own, results will still come to WPHL
8. Given nature of the disease CDC would call State Health Officer
    1. not just snail mail results back to WY

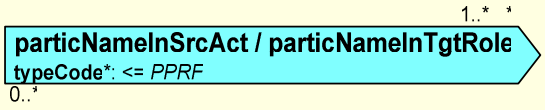
LIMS Workflow

1. Since WDOH LIMS won't actually be receiving the samples that will be confirmed at CDC, a Lab # won't be directly assigned
2. Indirectly, sample(s) will be assigned #s for tracking purposes and for ease of receiving CDC confirmatory report(s)
3. Once LIMS has received data back from CDC confirming positive bot.,
    1. the WPHL confirms this receipt, then
    2. releases results electronically to ordering doc/epi/local PH
    3. Ideally, this would all go through ELR via HL7 messages
4. ***LIMS to IDR***

Here is an example of a standardized HL7 V3 Message for clinical data:



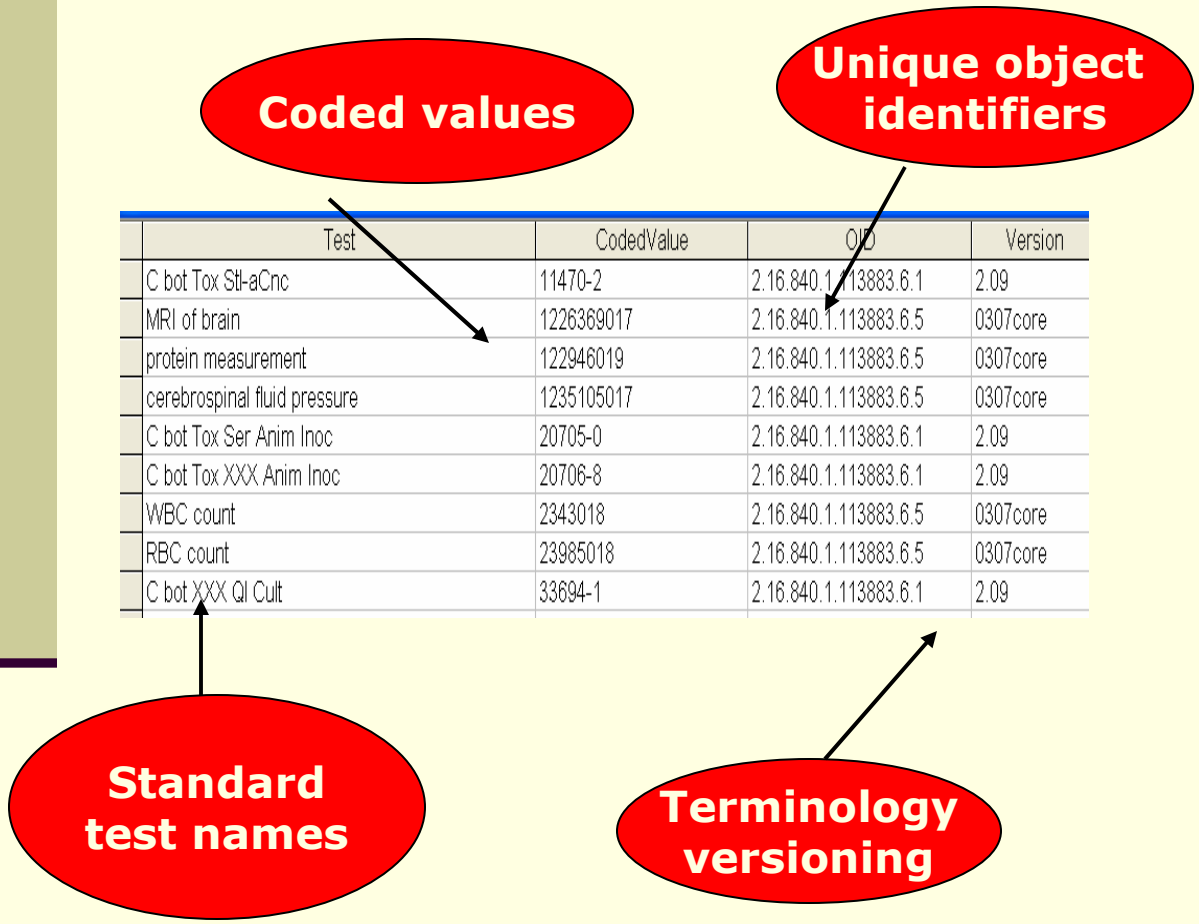
-Standard message needs to be developed with CDC



Workflow: IDR to HAN Notification

- Route of notification once in IDR:
  - Data now in Repository
  - Certain STANDARDIZED data elements/codes (ICD-9, LOINC, SNOMED, etc.) set by PH epis with threshold flags
  - Personalized monitors
    - Users can set up indiv. triggers; e.g., a triggering condition can be # of cases in given dataset within given period of time exceeds threshold
- Notification once IDR threshold met:
  - Trigger means an HL-7 alert gets sent to certain user roles- ie. INTO THE HAN

Here is an example of the data standardization needed for Messaging:



Test	CodedValue	OID	Version
C bot Tox Stl-aCnc	11470-2	2.16.840.1.113883.6.1	2.09
MRI of brain	1226369017	2.16.840.1.113883.6.5	0307core
protein measurement	122946019	2.16.840.1.113883.6.5	0307core
cerebrospinal fluid pressure	1235105017	2.16.840.1.113883.6.5	0307core
C bot Tox Ser Anim Inoc	20705-0	2.16.840.1.113883.6.1	2.09
C bot Tox XXX Anim Inoc	20706-8	2.16.840.1.113883.6.1	2.09
WBC count	2343018	2.16.840.1.113883.6.5	0307core
RBC count	23985018	2.16.840.1.113883.6.5	0307core
C bot XXX Ql Cult	33694-1	2.16.840.1.113883.6.1	2.09

-SNOMED

-LOINC

-HL7

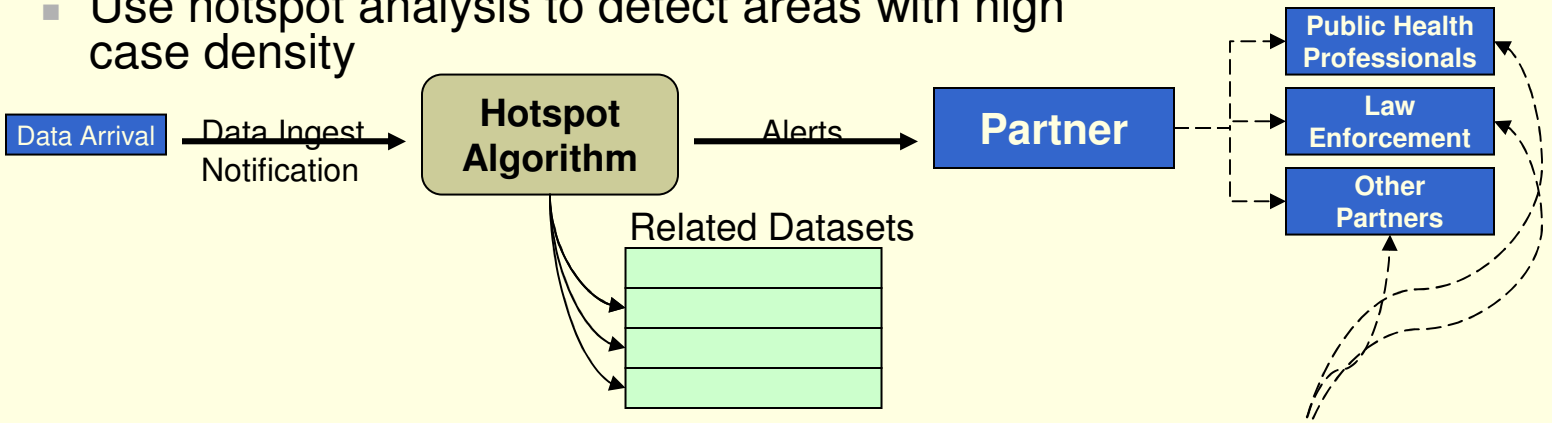
-NDC

Workflow: HAN Notification

- Show variety of roles/players notified depending on new information from lab, Env. Health traceback, fed food agencies (USDA/FDA), FBI, etc.
- Introduce GIS tool movie created by Dr. Ascher
  - GIS tool info. on ***real-time suspect bot cases*** would allow both researchers (CDC etc) and responders to be quickly aware of neighboring outbreaks
    - WY and CO as examples
      - CDC could message both states back immed. on outbreak
      - CDC could begin PulseNet/FoodNet analysis

IDR to HAN and OUT: Alert Mechanisms Design: Cross-Jurisdictional, Cross-Databases

- System-wide monitors
  - Use hotspot analysis to detect areas with high case density



- Personalized monitors
  - Users can set up individual triggers; e.g., a triggering condition can be that the number of cases in a given dataset within a given period of time exceeds a threshold